

Application No. 09/677,120
Amendment after Final Rejection dated December 23, 2004
Reply to Final Office Action dated October 4, 2004
Express Mail EV406652329US

Remarks/Arguments

The Office Action dated October 4, 2004, has been noted, and its contents carefully studied. Entry of the amendments is respectfully solicited, and reconsideration of the rejection under 35 U.S.C. §103 is also courteously requested.

Turning to the amendments to the specification, these are believed to be self-evident and correct previous unnoticed spelling and descriptive elements.

With respect to the amendments to the claims, it is noted that claim 1 has been amended to incorporate the limitations of claims 2 - 4 which are now canceled, and claim 11 has been amended to incorporate the limitations of claims 12 - 14 which have also been canceled.

It is respectfully urged that the amendments to the claims should be entered inasmuch as they do not introduce new issues and merely incorporate into the independent claims subject matter previously considered by the Examiner as part of the dependent claims, and is addressed in the prior Office Action, and in this Office Action. It is respectfully urged that the claims as amended are not obvious in light of the cited references. Nonetheless, even if the Examiner remains unpersuaded as to the allowability of the claims, the amendments should be entered inasmuch as they crystallize the issues for purposes of Appeal, and place the claims in better condition for consideration by the Board.

In reviewing the Office Action, it is noted that certain outstanding items have not been addressed. More specifically, in the previous Office Action an objection was made to the drawings requiring that Figure 1 should be designated by a legend such as "Prior Art". The prior Response included an Appendix consisting of Figure 1 labeled as "Prior Art". The current Office Action does not indicate whether the proposed replacement drawing sheet was accepted. Thus, since no objection to the drawings has been made, Applicant assumes that the drawing sheet was accepted, but if this assumption is incorrect, it is courteously requested that the Examiner indicate what additional objections if any still remain.

Turning now to the claims as amended, both with respect to the method and the system, a very specific methodology of how poaching occurs is recited, in a manner that is not believed obvious from the combination of references. More specifically, it is noted that the invention as recited requires that a predetermined period of time be timed during which a processor which is

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not idle remains not idle. After the time has elapsed, then a process is poached on a queue of the non-idle processor to be run by a processor which is idle. The poaching requires that if more than one processor is idle, the process which is poached is done by the idle processor which is electrically closest to the non-idle processor. In a yet still further aspect, the time period during which the non-idle processor is allowed to remain not idle is greater the farther away a non-idle processor is electrically located relative to an idle processor. The sequence requires that the idle processor tries to poach from the next processor electrically closest to it until it encounters a non-idle processor on which poaching can occur.

Notwithstanding the Examiner's assertions to the contrary, it is respectfully urged that these specific features in combination are not taught or obvious from the combination of the Alfieri and Kimmel references, as will become more clearly evident from the following discussion of the specifically cited section of these references which have been advanced by the Examiner for the proposition that the invention has claimed as obvious under 35 U.S.C. §103.

U.S. Patent No. 5,745,778 to Alfieri

U.S. Patent No. 5,745,778 to Alfieri (hereinafter "Alfieri") has been previously discussed at length, both in a previously filed Response as well as in the body of the application. As already discussed, Alfieri teaches a method of operation of a multi-processor data processing system in which "threads" are assigned priorities in limited portions of a range. More specifically, execution of a process is generally described as involving a plurality of thread groups, each with a plurality of threads (column 4, lines 8 – 9). The thread group is the basic unit of global scheduling across the system. The thread group structure maintains the global scheduling policy and global priority which are used to schedule the execution of the thread group (column 3, lines 53 – 56). The thread group structure also maintains the cumulative time slice and CPU accounting for all threads in its thread group. The particular method used by a CPU in selecting a thread group to execute occurs at two independent levels: global scheduling of a thread group followed by local scheduling of one of the thread group threads (column 4, lines 1 – 3).

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As noted, in the system of Alfieri, there are two levels of scheduling. All thread groups have a thread priority and can be scheduled globally to compete for CPU resources available anywhere in the system. Once a CPU has selected a thread group to run, the CPU will select a thread within the thread group according to the local priorities within the thread group. When a CPU becomes available to execute a thread, it looks at its own level 0 run queue, the level 1 run queue for its associated cache, and the level 2 run queue. If one or more thread groups are available, the CPU proceeds to check for the highest priority thread group. If the highest priority thread level is shared by thread groups on different run queues, the CPU will break the tie by selecting the run queue to use in a round-robin fashion.

Once a thread group is selected, the CPU begins the process of determining if the thread group can be moved closer to the CPU (see generally column 7).

As already previously disclosed, the system of Alfieri provides for very extensive searching by idle CPU's for threads or thread groups to be executed. As already discussed herein, this results in slowed system throughput and has nothing to do with Applicant's claimed method and system of timing a predetermined period of time during which a processor which is not idle remains idle prior to conducting the poaching. Yet still further, Alfieri has nothing to do with the method of poaching following the sequence of attempting to poach from processors which are idle and which are electrically closest to the non-idle processor. Moreover, it is respectfully urged that the teachings of Kimmel discussed hereafter are inconsistent with and contrary to those of Alfieri and it would not be obvious to apply the teachings of Kimmel involving setting flags (not automatically poaching) which indicates a process is available for being moved to a different processor.

U.S. Patent No. 6,105,053 to Kimmel et al.

U.S. Patent No. 6,105,053 to Kimmel et al. (hereinafter "Kimmel") has also been extensively previously discussed. It is respectfully urged that contrary to the Examiner's assertions, that Kimmel does not render obvious Applicant's invention when combined with Alfieri, and especially as now recited in the independent claims requiring a very specific sequence of poaching and timing before poaching.

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More specifically, the sections cited by the Examiner merely provide that in order to assist a thread group that is languishing, a medium term scheduler monitors the time during which the thread group is queued but not executed and performs one of three functions when the time has expired. The functions involved are: 1) boosting the priority of the thread group; 2) promoting the thread group to a higher, more visible level in the hierarchical level in the tree; or 3) setting the poach/help hint flag of the thread group (column 14, lines 10-20). This has nothing to do with timing the amount of time a non-idle processor remains non-idle and then poaching a process from that non-idle processor with an idle processor.

In fact, Kimmel teaches a more complicated system by providing that if after a second predetermined time period has expired, the medium term scheduler determines that the thread group has not progressed, the scheduler will promote the thread group to the next higher, more visible level in the hierarchical tree so as to make the thread group visible to the dispatchers of all subordinate processors, thus increasing the likelihood that a dispatcher in the same scheduling sub-tree will select the languishing thread group (column 14, lines 28 – 360). This has nothing to do with poaching after a predetermined time period and in fact is much more complicated and is only designed to increase the likelihood that poaching may occur. In a yet still further and more complicated sequence, a third time period is timed if the thread group has still not progressed. The medium term scheduler will then set the thread group poach/help hint flag so as to increase the likelihood that a dispatcher in a different schedule sub-tree will poach or help the thread group (column 14, lines 37 – 45).

Thus, in a sense Kimmel teaches contrary to the teachings of Alfieri and it would not be obvious to combine the two. In one instance, Alfieri requires aggressive poaching, which as already explained in the specification, is not desirable because of the lack of proximity between the data cache and processors. Kimmel on the other hand, is so concerned with maintaining proximity that carefully timed periods at three different levels are recorded and yet still no actual poaching occurs, but rather, certain events are triggered including setting flags to increase the likelihood of poaching, and it is certainly not in the manner recited in the independent claims as now amended.

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Other features of the invention are also not obvious from the Kimmel/Alfieri combination. For instance, although the Examiner asserts that Kimmel teaches each processor starting a timer as per claims 6 and 16, this is not the case since the timers are run by the schedulers and at three hierarchical levels.

As to independent claim 21, reconsideration is respectfully urged for the reasons given with respect to claim 6. This claim is similar to claim 1 as amended except that it does not require the requested searching of claim 4 which is now part of claim 1.

Thus, for the foregoing reasons, it is respectfully urged that all of the claims clearly define patentable subject matter under 35 U.S.C. §103 and at the very least, even if the Examiner disagrees with this conclusion, the amendments to the claims should be entered for purposes of Appeal. Nonetheless, should the Examiner still have any comments, questions or suggestions of a nature necessary to expedite the prosecution of the application, or to place the case in condition for allowance, he is courteously requested to telephone the undersigned at the number listed below.

Dated: December 23, 2004

Respectfully submitted,



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Enclosures

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